4 Management Direction

Tim McCabe/USFWS

Mallards at rest.

The management direction in this chapter meets the purposes, vision, and goals of the Arrowwood National Wildlife Refuge. This direction helps fulfill the mission of the Refuge System, maintains and where appropriate restores the ecological integrity of the refuge and the Refuge System, addresses significant issues and mandates, and is consistent with principles of sound fish and wildlife management.

The Section 7 biological evaluation for threatened and endangered species (see appendix U) documents that this CCP will have "no adverse effect for whooping crane, gray wolf, bald eagle, Dakota skipper, piping plover, and piping plover critical habitat."

This chapter contains the following sections:

- management summary
- goals, objectives, rationales, and strategies
- staffing and funding
- step-down management plans
- monitoring

4.1 Management Summary

The Service will maintain the biological potential of wetland and upland habitats at the refuge to support a well-balanced and diverse flora and fauna representative of the Prairie Pothole Region. A scientific-based monitoring program will be developed and incorporated in the HMP. Monitoring will measure the habitat and wildlife population response to management activities. Public use opportunities will be expanded with the construction of additional facilities and development of educational programs. Public use regulations will be clarified and modified where appropriate to enhance the quality and quantity of wildlife-dependent recreational opportunities.

Water Resources

Wetland habitats will be managed to provide habitat conditions for migrating waterfowl, migrating shorebirds, and nesting waterbirds. Properly timed water level manipulations will result in the development of various wetland habitats:

(1) deepwater, emergent vegetation habitat for black terns, Franklin's gulls, and heron and egret nesting habitat; (2) shallow water with emergent vegetation for pied-billed grebes and rails; (3) open water and submergent vegetation for eared grebes; and (4) annual plants for feeding waterfowl. Acres and location will vary from year to year. A monitoring plan will be developed and carried out to monitor the water manipulations, timing, habitat characteristics and response from the birds. The current long-range water management plan will be rewritten to reflect the habitat benefits to the colonial or overwater-nesting species.

This CCP proposes development of a plan to improve water quality entering the refuge and reduce peak flows in the upper James River watershed during spring runoff and summer rainfall events.

In addition to wildlife benefits, the water quality and flood prevention benefits of protecting small streams and wetlands are well documented. Small streams and wetlands provide natural flood control, maintain surface water and groundwater supplies, trap sediment, filter and process natural nutrients and pollutants, and sustain natural biological diversity. Agricultural and other land use changes near small streams and wetlands can impair the natural functions on headwater systems. Removal of natural vegetation, hardening of soil surfaces, removal or straightening of stream channels, and draining of small wetlands greatly reduces the amount of rainfall and snowmelt the watershed can absorb before it floods. This increase in water volume scours stream channels, which promotes additional flooding. The altered channels and lack of wetlands significantly reduce groundwater recharge, sediment retention, and recycling of nutrients. Downstream lakes and rivers have poorer water quality, greater fluctuations in flow, and less diverse aquatic life. Algal blooms and fish kills become more common and recreational uses are adversely affected.

As stated in the UWA (described in chapter 3 under "Water Quality"), the upper James River watershed (including portions of Stutsman, Foster, and Eddy counties) encompasses 1,773 square miles with 70% in cropland. Targeting cropland in key areas and converting it to permanent cover will reduce sedimentation and improve water quality. Restoring wetlands in these key areas will trap sediment, slow runoff, and reduce peak flows entering the refuge, resulting in increased groundwater recharge. Based on interpretation of the National Wetland Inventory maps, more than 7,000 acres of wetlands have been drained in Eddy and Foster counties.

The water quality and water retention capabilities of the upper James River watershed could be improved and the refuge's wetland objectives could be achieved through cooperative efforts. This will include working through existing programs, as well as with the Service's Private Lands Program, the NRCS, county soil conservation districts, water boards, the EPA, Reclamation, and private landowners.

Habitat and Wildlife

Upland habitats will be managed to maximize production of waterfowl and other grassland-nesting species. Areas of tame grass or DNC close to water will be managed primarily for tall DNC for waterfowl. Sharp-tailed grouse, other grassland birds, and small mammals will also benefit from this habitat type. Areas of native prairie will primarily be managed for ecological integrity, but will also provide important habitat conditions for upland-nesting birds, especially the grassland-endemic songbirds. The Grasshopper Hills area, which is probably the largest contiguous tract of native prairie, will be a priority tract for management.

© Jennifer Jewett

Early morning fog rolls over Arrowwood's uplands.

Upland habitats will be managed with grazing, prescribed fire, mechanical manipulations, chemical applications, biological control, and rest. The treatment applications will vary from year to year and will be applied as habitat objectives dictate. A monitoring plan will be developed and carried out to monitor the habitat characteristics and wildlife population response to management activities.

To reduce the impacts of woody vegetation on grassland-dependent birds, selected sites will be targeted for tree removal; grasslands invaded by trees in areas with populations of priority species will be targeted. Priority will be given to sites with planted tree rows (shelterbelts) within 164 feet of grassland patches greater than 247 acres, and to plantings of single rows and dilapidated stands of trees.

Cropping will be used to prepare fields for planting of DNC or native grasses.

Invasive plant control will be carried out as outlined in the IPM Plan (USFWS 2005).

Predator management will remain at the current level unless population monitoring results dictate otherwise.

Dave Menke/USFWS

Eastern bluebird.

Visitor Services

Public use will be enhanced with the improvement and expansion of wildlife-dependent recreation. The compatibility determinations in appendixes L–S detail the public use programs.

Opportunities to increase hunting and fishing will be reviewed and facilities constructed as funding became available. Due to recent changes made by the state regarding the early Canada goose season and resident-only waterfowl season, the periods for which the refuge is accessible to boats and canoes will be shortened to minimize disturbance and allow waterfowl to use the refuge as a rest area.

Refuge-specific regulations for access into the refuge for wildlife observation, photography, and other wildlife-dependent recreational uses will be clarified and, where appropriate, modified to eliminate or minimize potential conflicts between refuge user groups. For example, biking on vehicle trails will cease when archery deer season begins and walk-in access for wildlife observation and photography will not be recommended during the deer gun and muzzleloader seasons.

Environmental education programs will be developed for presentation on and off the refuge. Additional staff will seek out opportunities to share the story of the Refuge System and educate the public about the refuge's natural resources.

Additional wildlife-viewing opportunities will be explored with the possible development of additional trails, overlooks, and improved interpretive and directional signs. The office entrance will be remodeled to accommodate a small visitor contact area. Outdated and extraneous signs will be removed to enhance the aesthetic beauty of the refuge. The access road to the Warbler Woodland Watchable Wildlife Area will be upgraded, along with the directional signs to the trailhead and interpretive signs on the trail. A covered pavilion at the Warbler Woodland Watchable Wildlife Area is planned to accommodate workshops, group presentations, and environmental education. The refuge will maintain at least one portable observation blind on an active sharp-tailed grouse lek and seek a suitable site for a permanent blind.

4.2 Goals, Objectives, Rationales, and Strategies

Objectives and strategies to carry out the goals will provide for ecosystem and resource needs and public use.

- A goal is a descriptive, broad statement of desired future conditions that conveys a purpose, but does not define measurable units.
- An objective is a concise statement of
  what is to be achieved;
  how much is to be achieved;
  when and where it is to be achieved;
  who is responsible to achieve it.
- Rationale for each objective includes background information, assumptions, and technical details used to formulate the objective. The rationale provides context to enhance comprehension and facilitate future evaluations.
- Strategies are way to achieve an objective.

Development of goals and objectives for the refuge involved multiple sources of information:

- review and interpretation of national plans
- biological assessment of the refuge
- review of existing scientific literature
- evaluation of habitat conditions
- personal knowledge of planning team participants

Upland Goal

Provide a diversity of grassland types that emulate the range of natural variation characteristic of the Prairie Pothole Region to benefit trust resources including waterfowl, grassland birds, and songbirds.

NOTE: Arrowwood NWR contains about 11,340 acres of grassland, of which approximately 6,000 acres are native prairie. The potential natural vegetation of the area is cool-season, needlegrass-wheatgrass, mixed-grass prairie. Vegetation of the mixed-grass prairie is predominantly a mixture of western wheatgrass, needlegrasses, blue grama, little bluestem, and upland sedges. Interspersed within the grasses are numerous species of forbs and patches of shrubs comprised of western snowberry, Woods' rose, silverberry, or mixtures of these species (Kuchler 1964). Long-term management will be to provide pre-1870s vegetation composition and habitat characteristics of the grassland-dependent species currently exhibiting significant population declines. The remaining 5,340 acres are comprised of seeded natives, DNC, or other cool-season introduced grasses.


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Sharp-tailed grouse.

Upland Objective 1

Provide 4,000 acres of grassland habitats on a 5-year average, in blocks of a minimum of 100 acres in size with less than 30% shrub cover, located within 300 feet of brood water. Structural characteristics of these grasslands include variable visual obstruction readings (VORs) greater than 4 inches and variable vegetation heights greater than 6 inches. This will primarily benefit nesting waterfowl such as mallard, gadwall, and blue-winged teal. In addition, these vegetation characteristics will provide the habitat needs for sharp-tailed grouse, dickcissel, sedge wren, and common yellowthroat.

Rationale

The locations where this objective is met will change over time as burning, grazing, and mowing are used to manipulate the habitat. Structural characteristics such as litter, grass height, and density will be lowest the first one or two growing seasons following treatment and will increase each year after that. Since treatments will not be applied consistently over the entire landscape, this will result in a mosaic of vegetation structures.

Emphasis will be placed on DNC and other tame grass fields located within 300 feet of permanent and semipermanent water for nesting waterfowl. In addition to providing tall dense cover for nesting waterfowl, tame grass fields generally contain less than 10% shrub canopy. Tracts of native prairie located within 300 feet of permanent water will also be managed to provide tall, dense cover. This tall dense cover also provides optimal habitat for nesting sharp-tailed grouse and common yellowthroat, as well as nesting waterfowl.

Strategies

a. DNC and other tame grass fields will periodically be treated using grazing, prescribed fire, haying, and mowing. Approximately 30% of the 4,000 acres will have periods of 3–5 years rest between treatments for undisturbed nesting habitat. Prescribed fire and grazing will be used to remove excessive litter that is suppressing growth of favorable species such as wheatgrasses and forbs in DNC and native grasses and forbs in native prairie. Burning and grazing will improve nutrient cycling and encourage new vegetation growth and seed production. Haying and mowing will be used primarily for invasive plant control and litter reduction. In native prairie, haying and mowing will be used to reduce or maintain shrub canopy.

b. Croplands have been eliminated except as a means of rejuvenating DNC and for invasive plant control. Other seed mixes may be used once research is available for restoration techniques that are cost-effective and efficient. Fields in areas designated primarily for waterfowl production management will be planted to a DNC mixture. Recently, approximately 130 acres of cropland were seeded to DNC. Reduction of cropland will provide larger contiguous grassland tracts. Some existing grassland tracts may need to be cultivated and reseeded or "interseeded" with various grass and forb species to increase the height and density of the cover and provide the necessary structural characteristics for the species of interest. Approximately 2,200 acres of tame grasses will need to be rejuvenated in the next 15 years.

c. Some fields of native prairie will require an aggressive, systematic use of prescribed fire, grazing, haying, and mowing to reduce the brush canopy cover under 30% for sedge wren, Savannah sparrow, grasshopper sparrow, Baird's sparrow, bobolink and chestnut-collared longspur (Arnold and Higgins 1986, Bakker 2003). The common yellowthroat prefers tall dense cover, but with a higher brush composition of 30–60%. These thicker patches of brush are scattered throughout the fields and will continue to provide the habitat conditions necessary for breeding common yellowthroats.


USFWS

Unit G21, west Jim Lake, is treated with prescribed fire for brush reduction, litter removal, and grassland rejuvenation for ground-nesting wildlife.

d. Maintain the 38-acre predator exclosure to provide safe nesting habitat for waterfowl and other grassland-nesting species. The habitat within the fence will be maintained as DNC and periodically treated using prescribed fire or haying following the nesting season to maintain tall dense cover. The fence will be electrified from late March through July each year and the area trapped to ensure a predator-free nesting environment. The surrounding vegetation will be managed to minimize competing vegetation outside the fence and encourage nesting within the boundary of the fence. The fenced area

will be monitored annually to determine the nesting success.

e. Invasive plant species such as leafy spurge, wormwood, and especially Canada thistle will continue to be controlled using an integrated approach. Control methods will include mechanical and chemical treatments, but priority will be given to current and emerging biological control methods. Research will be encouraged to investigate improved methods to control invasive plants and analyze the effect of grassland management treatments on invasive plants.

f. Selected planted tree rows (shelterbelts) will no longer be protected from prescribed fire. Decreasing the number of trees will reduce perching sites for predators such as red-tailed hawk and great horned owl. Tree removal will increase field size and eliminate the "hostile" habitat within select grassland tracts. The abandoned firebreaks around the trees will be seeded to a vegetation mixture similar to the surrounding habitat.

g. Purchase of private inholdings to complete the legislated refuge boundary could provide an additional 3,200 acres of upland and wetland habitat that could be managed to provide the habitat required by many of the grassland-dependent species. The additional upland habitat could increase the field sizes and reduce the habitat fragmentation. In turn, this could increase the nesting success. Also, the addition of 260 acres of wetlands could increase the pair habitat to attract additional waterfowl pairs and other waterbirds.

Upland Objective 2

Provide 5,000 acres of grassland habitats on a 5-year average with less than 30% shrub cover and greater than 25% grass cover, in blocks of a minimum of 75 acres but preferably greater than 150 acres. Structural characteristics include a variable VOR greater than 4 inches and a variable vegetation height from less than 6 inches to greater than 20 inches. This will benefit nesting grassland Neotropical migrants including Le Conte's sparrow, clay-colored sparrow, Savannah sparrow, grasshopper sparrow, western meadowlark, and bobolink, in addition to other nesting species such as common snipe, willet, northern pintail, short-eared owl, and northern harrier. This grassland habitat will also support abundant small mammal populations that provide prey for numerous raptor species.

Rationale

This objective will increase diversity of both flora and fauna and will be mainly applied to the native prairie areas, but also will apply to tame grass fields located away from permanent water. The emphasis will be to return the native prairie areas to

S. Maslowski/USFWS

Bobolink.

conditions that existed prior to European settlement (pre-1870s), which provided the necessary habitat characteristics for many grassland-dependent species that are showing significant breeding population declines today. This will include reducing brush and exotic, cool-season grasses such as smooth brome and Kentucky bluegrass; and increasing the composition of the native grasses and forbs.

Strategies

a. Brush will be reduced. Currently, approximately 40% of the native prairie acreage has a brush canopy cover greater than 50%. Woody vegetation within or bordering prairie fragments will be reduced because it attracts nest predators and consequently reduces nesting success (Johnson and Winter 1999). These fields will require an aggressive, systematic use of prescribed fire during mid-July to late August to reduce western snowberry stems and increase the composition of native grasses and forbs. Haying and mowing will be used on those areas not conducive to prescribed fire. An integrated approach will be carried out using fire; grazing; and mechanical, chemical, and biological control methods to maintain the brush canopy cover under 30% and encourage native species.

b. Native vegetation composition will be increased. Native prairie areas will be rejuvenated and enhanced using grazing, prescribed fire, haying, and mowing when the native grasses and forbs have less than 50% canopy cover. Prescribed burning and grazing will be carried out during different periods of vegetative growth or, in combination, to attain specific objectives: (1) to remove excessive litter suppressing favorable species such as native grasses and forbs; (2) to reduce the competition between the native and nonnative species; (3) to reduce exotic cool-season grasses when at the 3- to 5-leaf stage; (4) to increase the native forb composition; (5) to provide nutrient cycling; and (6) to encourage new vegetation growth and seed production. The presence of various native grasses and forbs will provide the structural characteristics required by

most grassland-nesting species and foraging habitat and habitat needs for various invertebrates such as butterflies and moths. Native prairie areas will be aggressively treated with multiple treatments to reduce brush and increase the native species composition of grasses and forbs.

c. Decrepit DNC stands will be rejuvenated and enhanced using grazing, prescribed fire, haying and mowing when the VORs and vegetation heights fall below 50% of the maximum values (as identified in the habitat management plan to be completed by 2010). Prescribed fire and grazing will be used to (1) remove excessive litter that is suppressing favorable species growth such as that of wheatgrasses and forbs in DNC, (2) to increase nutrient cycling, and (3) to encourage new vegetation growth and seed production. Haying and mowing will be used primarily in the tame grass fields for invasive plant control and litter reduction and in native prairie fields to reduce or maintain shrub canopy. Tame grass fields with very low habitat value will require cropping for 2 or 3 years and reseeding with native grasses and forbs. As an alternative to farming, fields may be treated with a nonselective herbicide and then "no-till" seeded with native species.

d. The use of croplands will be eliminated except as a means of rejuvenating old DNC fields and for invasive plant control.

USFWS

Leafy spurge, a noxious weed, infested this area of the refuge prior to release of flea beetles for biological control in 1995.

e. Invasive plant species such as leafy spurge, wormwood, and especially Canada thistle will continue to be controlled using an integrated approach. Control methods will include mechanical and chemical treatments, but priority will be given to current and emerging biological control methods. Research will be encouraged to investigate improved methods to control invasive plants and analyze the effect of grassland management treatments on invasive plants.

f. Selected planted tree rows (shelterbelts) will no longer be protected from prescribed fire. Decreasing the number of trees will reduce perching sights for predators such as red-tailed hawk and great horned owl. Tree removal will reduce habitat fragmentation and eliminate the "hostile" habitat within select grassland tracts. The abandoned firebreaks will be seeded to a vegetation mixture similar to the surrounding habitat.

g. Purchase of private inholdings to complete the legislated refuge boundary will increase the size of several fields to meet the minimum required habitat size of 25–100 acres for most species.

Upland Objective 3

Provide a minimum of 1,600 acres of grassland habitats in blocks of at least 75 acres with less than 30% shrub cover and 15–70% grass cover. Structural characteristics include less than 4 inches VOR and variable vegetation heights ranging from 6 to 20 inches to benefit Vesper sparrow, chestnut-collared longspur, horned lark, upland sandpiper, and marbled godwit (Kantrud and Higgins 1992).

Rationale

This set of grassland habitat characteristics exists off the refuge and in abundance on private lands. Smaller areas are available on refuge hilltops and within the thin upland soil types. In addition, this habitat will be provided at the refuge for one or two growing seasons following management treatments applied to achieve upland objectives 1 and 2.

Strategies

a. The development of mini-joint-venture grazing systems that encourage rest on adjacent private lands will continue.

b. The potential for reintroduction of prairie dogs will be evaluated.

c. Purchase of private inholdings to complete the legislated refuge boundary will increase the size of several fields to meet the minimum required habitat size of 25–100 acres for most species.

Upland Objective 4

Maintain existing wooded ravines and trees in riparian zones that historically supported woody vegetation.

Rationale

The 660 acres of riparian floodplain and wooded ravines are primarily associated with the James River valley and lakeshores within the refuge. These native woodlands provide habitat for many woodland-dependent species. Although these habitats cover less than 1% of the northern Great Plains, wooded ravines can attract a disproportionately rich number of bird species

compared to other plains habitats (Dobkin 1992.) These woody habitats increase species diversity by providing the migration and breeding habitats for many migratory land birds. Some of the bird species that use these habitats include Cooper's hawk, black-billed cuckoo, least flycatcher, willow flycatcher, great-crested flycatcher, red-eyed vireo, yellow warbler, and northern oriole.

Strategies

a. The woody ravines will not be intentionally burned; however, they will not be protected from prescribed fire treatments. Fires historically kept the ravines in early successional plant species, which benefited many birds.

b. Management treatments to increase bur oak germination in the riparian zones will be investigated.

Wetland Goal

Provide a diversity of wetland types that emulate the range of natural variation characteristic of the Prairie Pothole Region to benefit threatened and endangered species, waterfowl, shorebirds, wading birds, and other wetland birds.

Wetland Objective 1

Provide 1,250 acres (50%) consisting of 30–60% emergent vegetation, primarily bulrushes and cattail, interspersed with 40–70% open water that supports beds of aquatic vegetation, preferably sago pondweed, with water depths of 8–20 inches (stable or slightly declining) between May 1 and August 1.

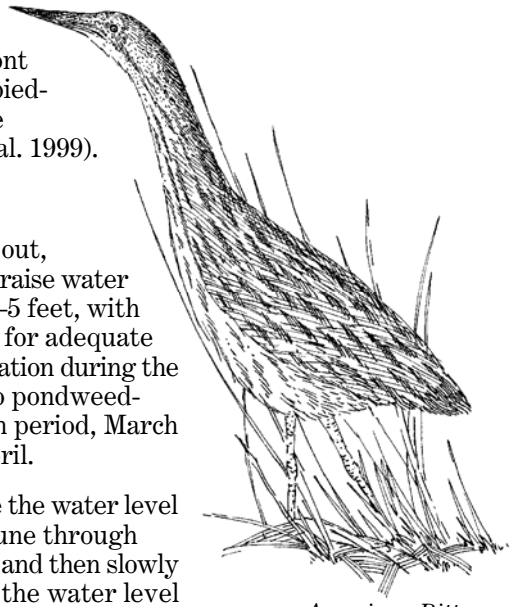
Rationale

This vegetation will provide brood habitat for dabbling ducks such as mallard, gadwall, and blue-wing teal and foraging habitat for migrating diving ducks and tundra swan.

Beds of aquatic vegetation provide foraging habitat for breeding dabbling ducks, herons, egrets, grebes, canvasback, and tundra swan (Earnst 1994, Kantrud 1990) in the fall. This objective will be applied to Arrowwood and Jim lakes.

A minimum of 25% wetland habitat will support dense emergent vegetation with a VOR greater than 12 inches and vegetation height greater than 20 inches to provide nesting habitat for American bittern (Laubhan and Roelle 2001), black-crowned night-heron, canvasback, redhead, common yellowthroat, and sedge wren.

A minimum of 25% wetland habitat will support sparse emergent vegetation with a VOR ranging from 4 to 12 inches and vegetation height ranging from 6 to 20 inches to provide nesting habitat for black tern (Bergman 1970, Naugle et al. 2000), Franklin's gull (Du Mont 1940), and pied-billed grebe (Naugle et al. 1999).



American Bittern
© Cindie Brunner

Strategies

a. After ice out, maintain or raise water depths to 3–5 feet, with clear water for adequate light penetration during the critical sago pondweed-germination period, March through April.

Slowly raise the water level from mid-June through September, and then slowly draw down the water level through October, to develop 3- to 5-foot bands of seasonally flooded emergent vegetation. Emergent vegetation establishment may take several years of low water levels. A fringe of emergent vegetation around the shoreline will reduce wind erosion and re-suspension of sediments. Reflood the emergent vegetation the following spring to provide nesting and brood cover.

b. Reduce sedimentation rates by working with other federal and state programs to improve the upper James River watershed. Conserve, restore, enhance, and create habitat resources in watersheds to influence the quality and quantity of water flowing into rivers and streams.

c. Control rough fish by reducing water levels enough to result in fish kills during winter months, as conditions dictate.

d. Use Arrowwood Lake to store water for management of other pools as long as sago production is unimpeded.

Wetland Objective 2

Provide 300 acres consisting of greater than 80% emergent vegetation (such as bulrushes and cattail) and 0–20% open water with depths ranging from moist to 8 inches, between May 1 and August 1, in patches greater than 25 acres.

Rationale

Thick stands of bulrushes and cattails provide nesting habitat for black tern, eared grebe, western grebe, Franklin's gull, sora, and Virginia rail. This objective will target Arrowwood and Jim lakes.

Strategies

a. Control rough fish by reducing the water level enough to result in fish kills during winter months.

b. Raise water levels slowly until May1, to depths of 1–4 feet, then maintain at stable or slightly declining levels between May 1 and August 1 to favor emergent vegetation growth along edges. Emergent vegetation establishment may take several years of low water levels. A fringe of emergent vegetation around the shoreline will reduce wind fetch and re-suspension of sediments. Reflood the emergent vegetation the following spring to provide nesting and brood cover.

c. Reduce sedimentation rates by working with other federal and state programs to improve the upper James River watershed. Conserve, restore, enhance, and create habitat resources in watersheds to influence the quality and quantity of water flowing into rivers and streams.

d. Use Arrowwood Lake to store water for management of other pools as long as sago production is unimpeded.

e. When expanses of emergent vegetation exceed 150 acres, draw down the lake and disturb with prescribed fire or disking to set back plant succession.

Wetland Objective 3

Provide 500 acres of open-water habitats consisting of 20–100% submergent aquatic vegetation (such as pondweed, bladderwort, and coon's tail) in patches greater than 8 acres, with depths ranging from moist to 8 inches, between May 1 and August 1.

Rationale

Patches of submergent aquatic vegetation provide habitat for nesting black tern, eared grebe, western grebe, Franklin's gull, sora, and Virginia rail. In addition, this vegetation provides foraging habitat for breeding dabbling ducks, herons, egrets, grebes, canvasback, and tundra swan in the fall. This objective will target Arrowwood and Jim lakes.

Strategies

a. After ice out, maintain or raise water depths to 3–5 feet, with clear water for adequate light penetration during the critical submergent vegetation germination period, March through April.

b. Beginning in July, slowly draw down water levels in selected pools to 8 inches, through July.

Wetland Objective 4

Provide 300–600 acres of less than 12 inches tall emergent vegetation (such as rushes, sedges, and spikerush) that is flooded with less than 8 inches between April 1 through June 1, and between July 15 through November 30 with a VOR of less than 4 inches (or approximately less than 1.4 stems per square foot).

Tim McCabe/USFWS

Western grebe.

Rationale

This objective will provide nesting habitat to benefit foraging waterfowl and migrating shorebirds. This objective will target the Mud Lake and Depuy Marsh subimpoundments and Stony Brook. Approximately one-third of the units will be managed to achieve this objective on an annual basis.

Strategies

a. In the early spring, draw down selected ponds to initiate new growth of spikerushes and expose old clumps of rushes, bulrushes, grasses, and sedges for rail habitat (Fredrickson and Taylor 1982).

b. In the fall, slowly draw down selected ponds to concentrate foods for migrating waterfowl and other waterbirds.

Wetland Objective 5

Provide annually approximately 300–600 acres of greater than 80% cover of seed-producing vegetation (such as smartweeds, millet, beggarticks, and sedges) flooded to depths less than 8 inches, between April 1 and November 30.

Rationale

Annual seed-producing vegetation will provide habitat for foraging waterfowl and shorebirds. This objective will target the subimpoundments;

approximately one-third of the units will be managed to achieve this objective on an annual basis.

Strategies

a. Periodically flood nine moist soil units to depths less than 12 inches. Every third year or as conditions dictate, completely draw down the units in the spring and early summer, then dry, and disturb and reflood the soil surface to increase the sprouting of seeds within the soil.

Use early drawdowns to stimulate germination of smartweeds. Mid-season drawdowns will result in millets and late-season drawdowns will produce beggarticks. Once plants reach 6–8 inches in height, shallowly (1–2 inches) flood them. As the perennials increase, so do the invertebrates that provide foraging habitat for waterfowl, rails, and herons. The uneven topography of pools will provide foraging habitat for the various wildlife groups migrating through the area. Shorebirds will use the mud flats and shallow water areas with 2 inches or less of water, wading birds will use those areas with water depths from 3 to 5 inches deep, and waterfowl will have areas available with water depths ranging from 5 to 10 inches deep.

Time to shorebird migration the early spring drawdowns with shallow water zones interspersed with mud flats. The new growth of spikerushes and old clumps of rushes, bulrushes, grasses, and sedges provide concealment for rails (Fredrickson and Taylor 1982).

Wetland Objective 6

During years of severe drought in the region, maintain low water levels in Jim Lake to provide exposed gravel islands and shoreline habitat during piping plover nesting season.

Rationale

The piping plover has been recorded nesting at the refuge during years of low water that exposed the gravel islands and shoreline habitat the bird prefers for nesting. Because the refuge has a history of piping plover use, it has designated critical habitat for piping plovers. Piping plovers are not expected to nest regularly at the refuge. However, in years of severe drought when habitat is limited across the state, Jim Lake will be managed to provide access to the gravel islands and gravel side slopes of the dike along the eastern edge of the lake.

Strategies

a. Draw down Jim Lake to maintain exposed gravel islands and shorelines from mid-May through mid-July.

b. Participate in the International Piping Plover Breeding Census at the refuge every 5 years.

Wetland Objective 7

Improve water quality in the watershed upstream of the refuge and also water leaving the refuge. Reduce peak flows entering the refuge during spring snowmelt and summer rainfall events to reduce flooding and improve water management capability.

Rationale

During high-water events, most water entering the refuge will be diverted into the bypass channel at the southern end of Arrowwood Lake. This practice will limit opportunities to improve the quality of water leaving the refuge. However, managing water levels in Arrowwood Lake to promote emergent vegetation growth along the shoreline and other shallow areas will improve water quality by increasing plant uptake of nitrogen and phosphorous.

Another water quality problem that has existed for many years is lack of dissolved oxygen during periods of low flow and under ice (Reclamation 1992). To help alleviate this problem, water released from Arrowwood Lake into other impoundments and the bypass channel will be from the top of the water column, which usually has higher dissolved oxygen levels. Furthermore, as water drops over the water control structure and mixes with air, dissolved oxygen levels will be increased.

When water is diverted from Arrowwood Lake or the bypass channel into other wetland units, there will be additional opportunities for improving water quality. Sedimentation rates will increase as water levels are maintained to provide migratory bird habitat. Water levels will be managed to promote growth of desirable aquatic vegetation, which will greatly increase plant uptake of organic nutrients. Wetland units will be periodically drawn down and burned or disked to recycle nutrients and set back succession. As part of the Arrowwood NWR mitigation project, fish barriers were installed to prevent carp from entering the bypass channel and the wetland units. Excluding carp will also benefit water quality by reducing turbidity. As with Arrowwood Lake, water released from these units will be from the top of the water column and dissolved oxygen levels will be increased when the water drops over the structure.

Strategies

a. Use stream-gauging data in conjunction with water quality models to calculate a mass nutrient balance for the refuge. The Water Resources Division of the USGS maintains stream gauging stations on the James River, both upstream and

downstream of the refuge. Data collected at these gauging stations include streamflow and water chemistry. This data, when combined with water quality models, can be used to calculate a mass nutrient balance for the refuge. A mass nutrient balance assesses nutrient load entering and leaving the refuge, providing insight into the refuge's role as a nutrient source or nutrient "sink" for downstream water users.

b. Work with the watershed managers from county soil conservation districts to use the agricultural nonpoint source (AGNPS) model. The AGNPS model predicts soil erosion and nutrient transport and loadings from agricultural watersheds for real or hypothetical storms. It can be used in evaluating the effect of management decisions impacting a watershed. It can also be used to target areas in the upper watershed for "best management practices" such as minimum tillage, grass waterways, filter strips, green belts, and grazing systems that will provide the greatest water quality benefit to the refuge.

c. Achieve the goals of the Federal Water Pollution Control Act by developing partnerships with county, state, and federal agencies. In cooperation with the state health department and the EPA, identify potential projects in the upper watershed that qualify for Clean Water Act funding.

d. Use available resources to determine priority wetlands and grasslands in the upper James River watershed for protec tion and restoration. In these same priority areas, the proportion of perennial cover will be increased; where permanent cover restoration was not possible, annual cover such as winter cereals for nesting waterfowl will be increased.

Visitor Services Goal

Visitors of all abilities will enjoy a refuge visit and increase their knowledge and appreciation of the prairie ecosystem and the refuge's history by participating in compatible wildlife-dependent recreation.

NOTE: Appendixes L–S contain compatibility determinations for the public uses at Arrowwood NWR.

Visitor Services Objective 1—Hunting

Continue to provide and increase opportunities as compatible and appropriate for accessible hunting of big game, upland birds, small game, and fox.

Rationale

Current refuge-specific regulations are designed to provide opportunities for a quality hunt within the laws imposed by the state. The definition of a quality hunt is completely determined by the individual participating in the activity. In a survey of 10,000 hunters conducted by the Wisconsin Department of Natural Resources in 2000, hunters were asked to rate the factors having the most influence on their perception of a quality hunt. The most important factor indicated by the respondents was seeing game. The second most frequent answer was spending time with friends and family, and the least important factor in determining a quality hunt was the weather. Successful hunters (harvest of game pursued) rated their hunt quality as very high or fairly high 22% of the time, while unsuccessful hunters (no game harvested) rated their hunt quality as very high or fairly high only 7% of the time. Other factors determined to be integral to a quality hunt include seeing few other hunters, ethical behavior by all participants, safety, and the opportunity to harvest trophy animals (Dhuey 2004). The compatibility determination for hunting is in appendix L.

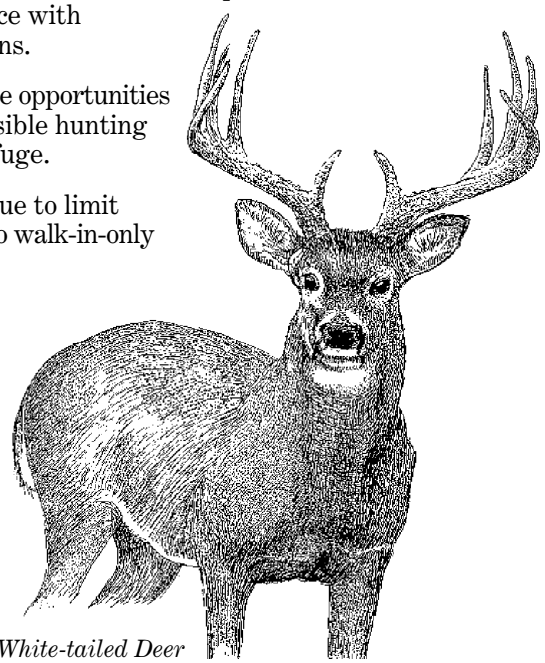
Strategies

a. Revise the current hunting brochures and "tear sheets" that provide information on refuge hunting regulations, and access.

b. Continue to work cooperatively with the NDGF to conduct law enforcement patrols to ensure compliance with regulations.

c. Increase opportunities for accessible hunting at the refuge.

d. Continue to limit hunting to walk-in-only access.



White-tailed Deer

Visitor Services Objective 2—Fishing

Continue to provide public opportunity for accessible fishing, including bow fishing for rough fish during high-water years and ice fishing when conditions permit.

Rationale

Fishing is a compatible priority public use and will continue to be supported. See the compatibility determination in appendix M.

Strategies

a. Update and revise brochures that provide information on refuge fishing opportunities, regulations, and access.

b. Use local media to promote fishing opportunities during high-water years when the fishery is active.

c. Permit fishing, in accordance with state regulations, year-round except during the deer gun and muzzleloader seasons.

d. Allow boats from May 1 through August 31.

e. Allow, on Arrowwood and Jim lakes, boats with less than 25 horsepower motors.

Visitor Services Objective 3—Wildlife Observation and Photography

Provide the public opportunities for accessible wildlife/wildland observation and photography for at least 10,000 visitors per year.

Rationale

The refuge's auto tour route and locations around Jim Lake and the Depuy pools provide excellent opportunities for viewing and photographing wildlife. These are compatible priority public uses (see the compatibility determination in appendix O).

Strategies

a. Continue to maintain the refuge's 5.5-mile auto tour route to provide a safe and enjoyable experience for visitors.

b. Update and revise the interpretive brochure. Clarify and revise regulations regarding access into the refuge for walk-in access, biking on refuge trails, and horseback riding (special use permit).

c. Upgrade the access road to the Warbler Woodland Watchable Wildlife Area.

d. Improve and maintain the nature trail in the Warbler Woodland Watchable Wildlife Area by adding directional signs to the trailhead and replacing the interpretive signs.

e. Maintain at least one observation blind located near an active sharp-tailed grouse lek. Locate a suitable site for installation of a permanent, accessible blind.

f. Investigate new opportunities for compatible wildlife viewing, with the possible development of additional trails and overlooks.

g. Develop and upgrade wildlife and bird lists as new information becomes available.

h. Allow boats from May 1 through August 31.

i. Allow, on Arrowwood and Jim lakes, boats with less than 25 horsepower motors.

Visitor Services Objective 4—Interpretation

Increase public awareness and advocacy by reaching 10,000 people annually using accessible programs, exhibits, signs, and pamphlets that interpret refuge management activities, and the natural, cultural, and historic resources.

Rationale

By expanding the interpretive and public outreach activities at the refuge, the public will be made aware of the Refuge System and Arrowwood NWR and the benefits it provides to wildlife and the local community. This is a compatible priority public use (see the compatibility determination in appendix P).

Strategies

a. Remodel the office entrance to include a visitor contact station containing interpretive exhibits and a cooperative association store.

b. Develop permanent exhibits at local community locations to increase awareness of national wildlife refuges in North Dakota.

c. Widely disseminate informational leaflets to libraries, local businesses, chambers of commerce, recreational groups, local lodging, and designated rest areas along interstates.

d. Develop a portable travel exhibit interpreting the refuge and its key resources.

e. Develop a professional-quality presentation on Arrowwood NWR and the Refuge System.

f. Create a native grass and forb demonstration plot, complete with interpretive signs and identification markers for each species.

g. Work with tourism division of the North Dakota Commerce Department, and North Dakota Department of Transportation to install directional signs off Interstate 94 and state highways.

h. Maintain existing interpretive panels.

i. Develop and place new entrance signs at each main refuge access road.

j. Interpret the cultural history including the Fort Totten Trail, the story of Limpy Jack, and the legend of Grasshopper Hills.

k. Interpret the geology of the refuge and surrounding area.

Visitor Services Objective 5—Partnerships and Other Public Outreach

Foster advocacy and develop public awareness of refuge resource issues and management practices through accessible public outreach.

Rationale

Fostering relationships within the community will help the refuge open the lines of communication, build support for the refuge, and provide an avenue for discussion. The Service recognizes that communication is vital to the Service mission. Refuge staff will continue to seek out new opportunities and foster existing relationships to help with achieving mutually beneficial goals and objectives.

Strategies

a. Pursue development of a "friends group."

b. Develop partnerships to increase volunteer opportunities at the refuge.

c. Annually update the refuge website.

d. Send out monthly news releases to communities regarding refuge events and management activities. Conduct radio and television spots on request.

e. Attend local wildlife and community group meetings on a regular basis to provide information on refuge activities, management, and other issues.

f. Continue to work with the nonprofit organization, Birding Drives Dakota, on the annual "Potholes & Prairie Birding Festival" and visits to the refuge.

g. Annually participate in at least five outreach programs such as holding events for National Wildlife Refuge Week and International Migratory Bird Day, or staffing a booth at a local event.

h. Work with congressional offices and external affairs to keep them informed of refuge activities and management issues. Build and maintain relationships with county officials.

Visitor Services Objective 6—Environmental Education

Promote the Refuge System and Arrowwood NWR by conducting or hosting at least 10 environmental education programs per year to local schools and groups on the wetlands and grasslands within the Prairie Pothole Region.

Rationale

By expanding the environmental education activities at the refuge, the public will be made aware of the Refuge System and Arrowwood NWR and the benefits it provides to wildlife and the local community. This is a compatible priority public use (see the compatibility determination in appendix P).

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Prairie lily.

Strategies

a. Enhance the OWLS, located at the Kensal Public School, with interpretive signs or a brochure describing the native vegetation.

b. Develop environmental education trunks complete with hands-on items such as mammal skins and skulls, to be used during presentations and tours with various school groups and organizations.

c. Develop field study equipment kits to be checked out by visitors or organized groups. Include a backpack with binoculars, field guides, hand lenses, dip nets, tweezers, ruler, pen, vials, and other supplies.

d. Replace the bathhouse at the Warbler Woodland Watchable Area with a "learning pavilion" that will facilitate hosting outdoor classrooms. There is potential for an addition to the headquarters to add space for exhibits and visitors.

e. Involve local schools to develop an education program that can be used to explain the refuge management practices, and the wildlife and habitats found at the refuge.

4.3 Staffing and Funding

Current staffing consists of 10 permanent, full-time employees (table 2). This current staff, plus additional staff, as shown in table 2 will be required to carry out all aspects of the CCP.

Table 2. Current and additional staff required to carry out the management direction for Arrowwood NWR, North Dakota.

Staff Group	*Current Management*	*CCP Management Direction*
Management	Project leader, GS[1]-14* Deputy project leader, GS-13* Refuge operations specialist, GS-7/9/11*	Project leader, GS-14* Deputy project leader, GS-13* Refuge operations specialist, GS-7/9/11* Refuge operations specialist, GS-9
Biology	Wildlife biologist, GS-9/11*	Wildlife biologist, GS-9/11* Biological technician, GS-7 Fish and wildlife biologist, GS-5/7/9/11 Biological technician, GS-5/6/7
Visitor Services	Outdoor recreation planner (assigned to Long Lake NWR), GS-9	Outdoor recreation planner, GS-9 Park ranger, GS-7/9
Administration	Administrative officer, GS-11* Clerk (office assistant), GS-6*	Administrative officer, GS-11* Clerk (office assistant), GS-6*
Maintenance	Engineering equipment operator, WG[2]-10 Tractor operator (term[3]), WG-6	Engineering equipment operator, WG-10 Tractor operator (term), WG-6 Maintenance worker, WG-7/8 Maintenance worker, WG-6
Fire	Fire management officer, GS-11* Fire technician, GS-6/7*	Fire management officer, GS-11* Fire technician, GS-6/7* Range technician (career-seasonal), GS-5/6
	Total Cost of Staff Salaries and Benefits	
	$754,746	$1,214,662

[1]*GS=general pay schedule.*
[2]*WG=wage grade pay schedule.*
[3]*term=temporary time-limited position.*
[4]*career-seasonal=permanent seasonal position.*
**Staff with responsibilities for the entire Arrowwood NWR Complex.*

Base operational funding for fiscal year 2007 is $1,327,000. With additional funds for annual maintenance, deferred maintenance, small equipment, and the fire program, the total is $1,759,500. This base budget represents the minimum required to maintain existing programs. However, this budget level will not adequately support the CCP's management direction for habitat management, biological monitoring, public use and education programs, and maintenance of all facilities and structures.

Additional funding to carry out the CCP may be made available through Refuge System funding and the Service Asset Maintenance Management System (SAMMS). The SAMMS is a database that records maintenance and replacement needs for real property. Cost estimates will be developed for projects needed to carry out the final CCP, and then entered into the SAMMS.

4.4 Step-down Management Plans

A CCP is intended as a broad umbrella plan that provides general concepts and specific wildlife, habitat, endangered species, visitor services, and partnership objectives. Step-down management plans provide detail to managers and staff who carry out specific actions authorized in a CCP. Based on this CCP, table 3 displays plans needed for Arrowwood NWR.

Table 3. Step-down management plans for Arrowwood NWR, North Dakota.

Plan	*Status*
Disease Contingency Plan	To be completed in 2006
Environmental Management Plan	Completed in 2003; revised annually
Fire Management Plan	Completed in 2001; revised annually
Habitat Management Plan (HMP)	To be completed in 2010
Integrated Pest Management Plan (IPM Plan)	Completed in 2005
Law Enforcement Plan	To be completed in 2008
Visitor Services Plan	To be completed after the CCP is final
Predator Management Plan	Completed in 2006
Safety Plan	Completed in 1991; revised annually
Water Use Plan	Completed in 2006; revised annually

4.5 Monitoring

Monitoring is essential not only to ensure that approved CCP goals and objectives have been met, but also to assess whether those goals and objectives have achieved the desired effects.

Plan Monitoring

Implementation of the CCP will be monitored throughout its 15-year effective period (2007 through 2022). The supervisor of the project leader for Arrowwood NWR will annually monitor accomplishment of objectives in the CCP. Monitoring of accomplishments will be critical to carrying out the CCP.

It is reasonable to believe that substantial changes could occur within the Service during the next 15 years. The CCP objectives will be examined at least every 5 years to determine if revisions are necessary and to allow the addition or deletion of objectives.

Habitat and Wildlife Monitoring

Habitat management on refuges is an ongoing process, and the Service recommends that planning be conducted within the context of adaptive resource management (USFWS 1995, 1996).

Monitoring is essential to successful implementation of the CCP. Periodic review of the CCP is required to ensure that established goals and objectives are being met and strategies are being carried out. Many of the objectives have associated monitoring strategies; others remain to be developed. A HMP and wildlife-monitoring plan will be developed with the specific details on monitoring techniques, frequency, and locations.

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Big bluestem.

An adaptive resource management approach to monitoring will be used. Adaptive resource management is a flexible management framework in

which the success of management strategies can be evaluated. Management techniques for habitat, wildlife, and public use will be periodically evaluated; results will be used to modify or adapt the techniques or objectives to better achieve refuge goals.

Effects of management strategies on habitats and wildlife populations will be evaluated to assess whether the desired effects have been achieved. Baseline surveys will be conducted for wildlife species for which existing data is lacking or not well documented. Monitoring protocols will be developed—cooperatively with the wildlife researchers within the USGS and universities, and with other professionals—to ensure proper data collections and analysis. A habitat-monitoring plan will be written; a wildlife inventory plan will be updated following completion of the CCP.

Habitat and wildlife-related research will be encouraged. Refuge staff will pursue research opportunities related to the refuge's habitat management goals, species of concern, monitoring techniques, and data analysis. All studies will be applicable and compatible with refuge objectives.

Monitoring for wildlife diseases will be limited primarily to the detection of avian botulism outbreaks in waterfowl in the wetlands. New diseases that are causing some concern and that may affect refuge wildlife include the West Nile virus, avian chlamydiosis, avian influenza, and chronic wasting disease.